AMENDMENTS TO THE CLAIMS

This listing of the claims will replace all prior versions, listings, of claims in the application:

Claim 1 (currently amended): A method for ~~the~~ closed loop control of fiber orientation of a moving web being formed on ~~in~~ a papermaking machine ~~process~~ comprising ~~the steps of~~:

a) performing on said moving web being formed on said papermaking machine on-line measurements of said fiber orientation;

b) transforming said on-line measurements to a plurality of indices;

c) comparing each of said plurality of indices arising from said transformed on-line measurements with an associated target and deriving therefrom a deviation for each of said plurality of indices from said associated target;

d) computing actions for controlling said fiber orientation based on said derived deviations and a response characteristic of said process; and

e) executing said control actions to minimize said derived deviations.

Claim 2 (currently amended): The method of Claim 1 wherein said method further comprises ~~the step of~~ obtaining from said on-line measurements of said fiber orientation a plurality of vectors each of which represent an associated one of a plurality of fiber orientation profiles and said transforming step includes ~~the step of~~ transforming each of said plurality of vectors to an associated one of said plurality of indices.

Claim 3 (currently amended): The method of ~~claims~~ claim 2 wherein each of said plurality of fiber orientation profiles $p(z)$ is transformed by the equation:

$$y = \frac{\int_{z_1}^{z_2} p(z)h(z)dz}{\int_{z_1}^{z_2} h^2(z)dz}$$

with a selected reference function $h(z)$ to produce an associated one of said plurality of indices.

Claim 4 (original): The method of Claim 3 wherein each of said plurality of fiber orientation profiles has individual data points and one of said plurality of indices is an average of all of said individual data points that are part of said associated one of said plurality of vectors.

Claim 5 (original): The method of Claim 3 wherein another of said plurality of indices is an indication of the tilting of said associated one of said plurality of vectors.

Claim 6 (original): The method of Claim 3 wherein another of said plurality of indices is an indication of the concavity of said associated one of said plurality of vectors.

Claim 7 (original): The method of Claim 3 wherein another of said plurality of indices is a signature of the variability of said associated one of said plurality of vectors.

Claim 8 (currently amended): The method of Claim 1 wherein said computing ~~step~~ is responsive to said plurality of deviations of indices from said associated targets as inputs for computing one of said control actions as an output.

Claim 9 (currently amended): The method of Claim 8 wherein said computing ~~step~~ comprises the step of using logic selected from fuzzy or non-fuzzy logic or any combination thereof for computing one of said control actions.

Claim 10 (original): The method of Claim 9 wherein said fuzzy logic comprises at least two of said inputs and one of said output with a plurality of fuzzy rules and a plurality of membership functions associated to each linguistic descriptions.

Claim 11 (original): The method of claim 9 wherein said non-fuzzy logic comprises at least a mathematical operation of a weighted sum of a plurality of said inputs for computing one of said control actions.

Claim 12 (currently amended): The method of Claim 8 wherein said computing ~~step~~ comprises ~~the step of~~ using a plurality of logic stages for computing one of said control actions.

Claim 13 (currently amended): The method of Claim 12 wherein said ~~step~~ of using a plurality of logic stages comprises ~~the step of~~ implementing each of said plurality of logic stages as logic selected from fuzzy or non-fuzzy logic or any combination thereof.

Claim 14 (original): The method of Claim 12 wherein said plurality of logic stages comprises two fuzzy logic stages.

Claim 15 (original): The method of Claim 12 wherein said plurality of logic stages comprises at least one stage that is fuzzy logic and at least one other stage that is non-fuzzy logic.

Claim 16 (currently amended): The method of Claim 1 wherein said executing ~~step~~ comprises ~~the step of~~ applying said control actions to control a papermaking machine having one or more headboxes.

Claim 17 (new): An apparatus for closed loop control of fiber orientation of a moving web being formed on papermaking machine comprising:

a) means for performing on said moving web being formed on said papermaking machine on-line measurements of said fiber orientation;

b) means for transforming said on-line measurements to a plurality of indices;

c) means for comparing each of said plurality of indices arising from said transformed on-line measurements with an associated target and deriving therefrom a deviation for each of said plurality of indices from said associated target;

d) means for computing actions for controlling said fiber orientation based on said derived deviations and a response characteristic of said process; and

e) means for executing said control actions to minimize said derived deviations.

Claim 18 (new): In combination:

a machine for making paper; and

apparatus for closed loop control of fiber orientation of a

moving web being formed on said papermaking machine comprising:

a) means for performing on said moving web being formed on said papermaking machine on-line measurements of said fiber orientation;

b) means for transforming said on-line measurements to a plurality of indices;

c) means for comparing each of said plurality of indices arising from said transformed on-line measurements with an associated target and deriving therefrom a deviation for each of said plurality of indices from said associated target;

d) means for computing actions for controlling said fiber orientation based on said derived deviations and a response characteristic of said process; and

e) means for executing said control actions to minimize said derived deviations.